

## Host-Plant Relations of Phytophagous Beetles in Mexico (Coleoptera: Bruchidae, Chrysomelidae, Curculionidae)

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This project was undertaken primarily to supplement the recorded information on the habits and distribution of the Mexican Chrysomelidae. Conducted during a two-month period during the summer of 1967, the field investigations were carried out throughout the entire country, with the exception of the California and Yucatan peninsulas.

There exists more information in print on the subject of host-plant relations relative to the Chrysomelidae than any other family of beetles; nonetheless, very little information is available for the species inhabiting Mexico. Mexican representatives of this family remain scantily collected and very frequently have not been the subject of recent taxonomic elucidation. For these reasons this research was undertaken to complement similar studies on the better known species inhabiting the United States and to provide a reference for those planning collecting trips to Mexico in the future. At the outset of this project there were only two published reports of the host-plant relations of the Clytrinae; those concerned only two species in all of North America. This paper presents information on more than 50 taxa of clytrines observed during this research. The findings clarify the general pattern of behavior exhibited by this group, a pattern not expected from the information previously available. It is to be expected, then, that the information presented below may be of equivalent significance to others who study the Chrysomelidae and the closely related Bruchidae and Curculionidae.

It is a frequent observation that insects in the adult stage often congregate in large numbers on certain plants. These plants are often closely "related" in taxonomic terms or are known to share the presence of specific chemical compounds. Where oviposition is the primary object of such aggregations, it is likely that such plants will furnish the energy and nutrition requirements for the subsequent generation (host-plant in the strict sense). Very frequently, however, a correlation with larval food habits is not observed, even though the choice of plants as aggregation sites may be more or less constant over wide geographic areas. The determination of the identity of such plants is of great value to the field collector, and a broader definition of host-plant as that plant which incites approach from a distance and inhibits extensive loco-

motory activity on contact proves more useful for a project such as this one.

The significance of this distinction is unfortunately often not realized until more advanced neurological investigation into the behavior of the species in question has been conducted. The ultimate goal of any such studies as this one is to determine by what means a phytophagous insect classifies the available plants and how it ultimately identifies a suitable host individual(s). Studies on individual host-plant selection is the first-step in understanding the process of coevolution (Ehrlich and Raven, 1964).

The initial orientation response in the search for a suitable host-plant may be the result of quite a varied range of stimuli. These possess in common the feature of operating over relatively long distances (vision, non-ocular radiation sensors, phototaxis, geotaxis, hygrotaxis, generalized olfaction, etc.). Owing to the generalized nature of the stimulus a great number of plant species may initially be visited, but unless the plant provides the necessary subsequent stimuli the insect soon leaves. These subsequent stimuli are nearly always olfactory and require contact (gustation) or near-contact; on occasion the responses may be the result of more generalized physical parameters (pilosity, tough cuticle, etc.) which also require subsequent contact examination (reviewed by Thornsteinson, 1960). A given phytophagous species at this stage of orientation seldom forms aggregates and the individuals are highly motile. Although the attempt was made not to collect individuals in this stage of orientation, undoubtedly some of the references which follow are the result of initial investigatory behavior; further research along these lines will clearly distinguish between these possibilities for any given case.

Once the insect has found a plant which satisfies the initial visual, tactile, and chemical requirements its behavior changes markedly. If not actively feeding, individuals often move back and forth within an area "dragging" their antennae and/or palps along the surface. Phytophags may exhibit clumping at this stage, though not necessarily on the species the larvae will consume.

In this study collections were made of such aggregations; however, the distinction could seldom be made as to whether the larvae habitually consume the plant on which the adults were observed, owing to the inconspicuous nature of oviposition and the temporal segregation of stages in the life-cycle. Although larval food-plant was determined in certain cases (e.g., contemporaneous larvae and adults of *Cassida pallidula* Boh., oviposition scars of *Mastotethus*, pupation chambers of

*Pseudochlamys*, eggs of *Chlamisus*, etc.) special indication will not be made in this report.

Herbarium specimens were made of all plants involved in this study (Andrew Moldenke #1486-2342). Identifications were obtained from Harold Moldenke, former curator of the N. Y. Botanical Gardens; the Compositae were determined by Rogers McVaugh, University of Michigan; and some of the Leguminosae by H. Irwin of the N. Y. Botanical Gardens. Nomenclatural designations reflect the system employed by the N. Y. Botanical Gardens and the specialists. Token samples of observed beetle populations were preserved and subsequently have been prepared with reference to my field notes. Determinations have been made of the Bruchidae by J. M. Kingsolver, U. S. National Museum; the Chlamisinae by J. Karren, Rollins College, Va.; and the Tany-mecinae by A. Howden, Ottawa, Canada, in return for use of the specimens. The Clytrinae were determined by the author. All other identifications are necessarily tentative and were made by the author with reference to the *Biologia Centrali-Americana* and the extensive collections of the California Academy of Sciences in San Francisco. (My thanks to Hugh Leech and E. S. Ross of the Academy for assisting me in the use of the collection.) Specimens of any beetle group may be obtained from myself for further study on the part of interested parties. Only relatively certain determinations are cited in this report (ca. 50-60% of the collected specimens).

This research was financed in part by the Committee on Systematics and Evolutionary Biology of the University of Kansas, the National Institutes of Health (5T01-GM-00365-08), and the Ford Foundation (FORD68-256).

#### BRUCHIDAE<sup>1</sup>

<i>Acanthoscelides chiricahuae</i> (Fall):	<i>Quercus undata</i> Trel. (FAG—Dur.) <i>Gymnosperma glutinosum</i> (Spreng.) Less. (COMP—DF)
<i>Acanthoscelides</i> spp.:	<i>Brickellia vernicosa</i> Rob. (COMP—Dur.) <i>Neltuma glandulosa</i> (Torr.) Br. & Rs. (MIMO—Son.)
<i>Algarobius prosopis</i> (LeC.):	<i>Vachellia Farnesiana</i> (L.) Wight & Arn. (MIMO—Jal.)
<i>Algarobius</i> n.sp. Kingsolver:	<i>Gymnosperma glutinosum</i> (Spreng.) Less. (COMP—Zac.)
<i>Merobruchus</i> n.sp. Kingsolver:	<i>Vachellia Farnesiana</i> (L.) Wight & Arn. (MIMO—Dur.) <i>Quercus undata</i> Trel. (FAG—Dur.)

<sup>1</sup> Determined by J. M. Kingsolver.

- Mimosestes amicus* (Horn): *Gymnosperma glutinosum* (Spreng.) Less.  
(COMP—Zac.)  
*Hymenoclea salsola* Torr. & Gray (COMP—Son.)
- Mimosestes humeralis* (Gyll.): *Eupatorium collinum* DC. (COMP—Chps.)
- Mimosestes sallaei* (Shp.): *Quercus undata* Trel. (FAG—Dur.)  
*Parthenium hysterophorus* L. (COMP—Sin.)  
*Mimosa monancistra* Benth. (MIMO—Dur.)
- Sennius celatus* (Shp.): *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Sin.)
- Sennius discolor* (Horn): *Earleocassia covesii* (A. Gray) Britt.  
(CAESAL—Son.)
- Stator sordidus* (Horn): *Baccharis ramulosa* (DC.) A. Gray  
(COMP—Nay.)
- Zabrotes planifrons* (Horn): *Havardia pallens* (Benth.) Br. & Rs.  
(MIMO—Sin.)
- Zabrotes* n.sp. Kingsolver: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Micho.)

## CHRYSOMELIDAE

### AULACOSCELINAE

- Aulacoscelis canduzei* Chap.: unident. palm  
On three separate occasions individuals of this genus were observed on palms.

### CRIOCERINAE

- Lema confusa* Chev.: *Datura inoxia* Mill. (SOLAN—Micho.)
- Lema* sp.: *Pithecellobium dulce* (Roxb.) Benth.  
(MIMO—Mor.)

### MEGALOPODINAE

Several individuals of *Mastotethus* were observed ovipositing on a certain plant. The herbarium specimens taken were sterile and not identifiable, but they definitely were *not* solanaceous.

### LAMPROSOMATINAE

Two different species of *Lamprosoma* were observed on *Vachellia Farnesiana* (L.) Wight & Arn.

### CRYPTOCEPHALINAE

- Cryptocephalus militaris* Suffr.: *Quercus purulbana* Trel. (FAG—Nay.)
- Cryptocephalus* spp.: *Mimosa monancistra* Benth. (MIMO—Dur.)  
*Salix Goddingii* Ball (SALIC—Ariz.)  
*Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Ariz.)  
*Brickellia vernicosa* Rob. (COMP—Dur.)  
*Ceanothus buxifolia* Willd. (RHAM—Dur.)

- Cryptocephalus* spp.: *Eysenhardtia polystachya* (Ort.) Sarg.  
(FABA—Jal.)  
*Pithecellobium dulce* (Roxb.) Benth.  
(MIMO—Mor.)  
*Hymenoclea salsola* Torr. & Gray (COMP—Sin.)  
*Baccharis ramulosa* (DC.) A. Gray  
(COMP—Nay.)  
*Neltuma glandulosa* (Torr.) Br. & Rs.  
(MIMO—Son.)  
*Senegalia Greggii* (A. Gray) Br. & Rs.  
(MIMO—Son.)  
*Ceanothus Fendleri* A. Gray (RHAM—Ariz.)  
*Hymenoclea salsola* Torr. & Gray (COMP—Sin.)  
*Quercus grisea* Liebm. (FAG—Dur.)  
*Poponax cymbispina* (Sprague & Riley)  
Br. & Rs. (MIMO—Jal.)
- Griburius* spp.: *Viguiera dentata* (Cav.) Spreng.  
(COMP—Guanj.)  
*Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Col., Chps.)
- Lexiphanes* sp.: *Baccharis angustifolia* Michx. (COMP—Sin.)
- Pachybrachys* spp.: *Poponax cymbispina* (Sprague & Riley)  
Br. & Rs. (MIMO—Micho.)  
*Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Dur., Jal.)  
*Cirsium* sp. (COMP—Nay.)  
*Ceanothus buxifolia* Willd. (RHAM—Dur.)  
*Brickellia vernicosa* Rob. (COMP—Dur.)  
*Oenothera rosea* Ait. (ONAG—Dur.)  
*Senegalia Greggii* (A. Gray) Br. & Rs.  
(MIMO—Son.)  
*Quercus purulbana* Trel. (FAG—Nay.)  
*Eupatorium havanense* H.B.K. (COMP—Dur.)  
*Ipomoea mutabilis* Lind. (CONV—Nay.)  
*Salvia inconspicua* Benth. (LAB—Micho.)

CHLAMISINAE<sup>2</sup>

- Chlamisus maculipes* (Chevr.): *Ipomoea pedicellaris* Benth. (CONV—Nay.)
- Chlamisus* spp.: *Larrea divaricata* Cav. (ZYGO—Son.)  
*Sida glutinosa* Commers. (MALV—Jal.)  
*Salvia albida* H. B. K. (LAB—Nay.)  
*Mimosopsis aculeaticarpa* (Ort.) Br. & Rs.  
(MIMO—Micho.)  
*Baccharis glutinosa* Pers. (COMP—Micho.)  
*Salvia* sp. (LAB—Jal.)  
*Melampodium divaricatum* (Rich.) DC.  
(COMP—VC.)

<sup>2</sup> Determined by J. Karren.

<i>Diplacaspis memnoniata</i> (Lac.):	<i>Neltuma glandulosa</i> (Torr.) Br. & Rs. (MIMO—Son.)
<i>Diplacaspis moestifica</i> (Lac.):	<i>Larrea divaricata</i> Cav. (ZYGO—Son.)
<i>Diplacaspis prosternalis</i> (Schaeff.):	<i>Vachellia Farnesiana</i> (L.) Wight & Arn. (MIMO—VC.)
<i>Exema</i> spp.:	<i>Ceanothus buxifolia</i> Willd. (RHAM—Dur.) <i>Hymenoclea salsola</i> Torr. & Gray (COMP—Son., Sin.) <i>Viguiera dentata</i> (Cav.) Spreng. (COMP—Micho., Ariz.) <i>Brickellia vernicosa</i> Rob. (COMP—Dur.) <i>Viguiera pauciflora</i> Brand.? (COMP—Micho.) <i>Verbesina sphaerocephala</i> A. Gray (COMP—Jal.) <i>Wedelia filipes</i> Hemsl. (COMP—Micho.) <i>Eupatorium havanense</i> H. B. K. (COMP—Dur.) <i>Verbesina Greenmani</i> Urb. (COMP—Jal.) <i>Baccharis heterophylla</i> H. B. K. (COMP—Jal.) <i>Baccharis ramulosa</i> (DC.) A. Gray (COMP—Nay.) <i>Encelia halimifolia</i> Cav. (COMP—Son.) <i>Senegalia Greggii</i> (A. Gray) Br. & Rs. (MIMO—Son.) <i>Franseria ambrosioides</i> Cav. (COMP—Son.)
<i>Pseudochlamys</i>	<i>Sida cordifolia</i> L. (MALV—Oax.)
<i>megalostomoides</i> Lac.:	<i>Ipomoea pedicellaris</i> Benth. (CONV—Mor.)

## CLYTRINAE

An account of the biology of this subfamily is presented in my *Revision of the Clytrinae of North America north of the Isthmus of Panama* (Moldenke, 1970). This research project amply demonstrated that in nearly every instance upon ecdysis the males assemble in groups (often in excess of 100) on the young vegetative portions of the Mimosaceae (and occasionally the Fabaceae). They are soon joined by the later emerging females, who leave soon after coition has been completed. Mated females are most often observed singly on isolated dead twigs 1½–3 feet from the ground (usually on composites). In these sites oviposition takes place, the female hanging beneath the substrate with her first two pair of legs, the hind pair helping to form the egg-covering which is either attached to the stalk atop a silken thread or dropped to the ground. Adult food consists of small quantities of flowers, buds, and young leaves of legumes.

## CHRYSOMELINAE

<i>Calligrapha consputa</i> (Stal):	<i>Sida carpinifolia</i> L. f. (MALV—Micho.)
<i>Calligrapha felina</i> Stal:	<i>Sida pyramidata</i> Cav. (MALV—Jal.)
<i>Calligrapha labyrinthica</i> Stal:	<i>Baccharis heterophylla</i> H. B. K. (COMP—Jal.)
<i>Calligrapha multipustulata</i> (Stal):	<i>Guazuma ulmifolia</i> Lam. (STERC—Jal.)
<i>Calligrapha pantherina</i> Stal:	<i>Verbesina sphaerocephala</i> A. Gray (COMP—Jal.)

- Leptinotarsa decemlineata* (Say): *Solanum* sp. (SOL—Nay.)  
*Abutilon americanum* (L.) Sweet  
(MALV—Sin.)  
*Solanum diversifolium* Schlecht. (SOL—Micho.)
- Leptinotarsa puncticollis* Jac.: *Verbesina virginica* L. (COMP—Jal.)
- Leptinotarsa typographica* Jac.: *Verbesina serrata* Cav. (COMP—Nay.)
- Leptinotarsa violascens* (Stal): *Cordia cylindrostachya* (Ruiz & Pav.)  
Roem. & Schult. (EHRET—Micho.)
- Leptinotarsa* sp.: *Pithecellobium dulce* (Roxb.) Benth.  
(MIMO—Mor.)
- Zygogramma arizonica* Schffr.: unident. composite (COMP—Ariz.)
- Zygogramma exclamationis* (Fabr.): *Xanthium strumarium* L. (COMP—Ariz.)
- Zygogramma malvae* Stal: *Sphaeralcea* sp. (MALV—Chih.)
- Zygogramma opifera* Stal: unident. composite (COMP—Ariz.)
- Zygogramma piceicollis* Stal: *Verbesina encelioides* (Cav.) Benth. & Hook.  
(COMP—D.F.)  
*Croton morifolius* Willd.? (EUPHORB—Oax.)  
*Eupatorium lasium* Rob. (COMP—Micho.)  
unident. composite (COMP—Chih.)
- Zygogramma signatipennis* (Stal): *Viguiera dentata* (Cav.) Spreng.  
(COMP—Micho.)  
unident. composite (COMP—Chih.)

## EUMOLPINAE

- Chrysodina ornata* Jac.: *Baccharis glutinosa* Pers. (COMP—Micho.)  
*Desmodium Lindheimeri* Vail (FABA—Micho.)
- Colaspis favosa* Lefev.: *Kallstroemia hirsutissima* Vail (ZYGO—Micho.)
- Colaspis gemmigeri* (Har.): *Solanum diversifolium* Schlecht. (SOL—Nay.)  
*Mimosa pigra* L. (MIMO—Nay.)
- Colaspis lebasii* Lefev.: *Prosopis* sp. (MIMO—Jal.)  
*Pithecellobium dulce* (Roxb.) Benth.  
(MIMO—Mor.)  
*Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Micho.)
- Colaspis prasina* Lefev.: *Solanum Hernandezii* Sesse & Moc.?  
(SOL—Pueb.)  
*Solanum diversifolium* Schlecht. (SOL—Nay.)  
*Solanum aculeatissimum* Jacq. (SOL—Nay.)  
*Verbesina Greenmani* Urb. (COMP—Micho.)
- Colaspis suturalis* Lefev.: *Adipera indecora* (H. B. K.) Br. & Rs.  
(CAESALP—Oax.)
- Colaspis* sp.: *Pithecellobium dulce* (Roxb.) Benth.  
(MIMO—Mor.)
- Coytiera fulvipes* Jac.: *Ipomoea stans* Cav. (CONV—Micho.)
- Coytiera rugipennis* Jac.: *Ipomoea stans* Cav. (CONV—Micho.)
- Eumolpus suranamensis* (Fab.): *Leonurus nepetaefolia* (L.) R. Br. (LAB—Jal.)

- Euphrytus opacicollis* Jac.: *Poponax cymbispina* (Sprague & Riley)  
Br. & Rs. (MIMO—Jal.)
- Fidia plagiata humeralis*  
(Lefev.): *Parthenocissus inserta* (Kerner) K. Fritsch  
(VIT—Ariz.)
- Fidia spuria* Lefev.: *Encelia halimifolia* Cav. (COMP—Son.)
- Glyptoscelis albicans* Baly: *Crotolaria mucronata* Desv. (FABA—Chps.)
- Glyptoscelis prosopis* Schffr.: *Prosopis* sp. (MIMO—N.L.)
- Metaxyonychia godmani* Jac.: *Verbesina sphaerocephala* A. Gray (COMP—Jal.)  
*Verbesina Greenmani* Urb. (COMP—Micho.)
- Nodonota* spp.: *Pithecellobium dulce* (Roxb.) Benth.  
(MIMO—Mor.)  
*Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Micho.)  
*Baccharis glutinosa* Pers. (COMP—Micho.)  
*Verbesina encelioides* (Cav.) Benth. & Hook.  
(COMP—D.F.)  
*Prosopis* sp. (MIMO—Jal.)  
*Pluchea odorata* (L.) Cass. (COMP—Chps.)
- Paria quadriguttata* LeC.: *Eupatorium havanense* H. B. K. (COMP—Dur.)  
*Salvia* sp. (LAB—Jal.)
- Prionodera amasia* (Marshall): *Baccharis heterophylla* H. B. K.  
(COMP—Micho.)
- Promecosoma dilatatum* Lefev.: *Verbesina sphaerocephala* A. Gray  
(COMP—Jal.)
- Promecosoma dugesi* Lefev.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Nay.)
- Promecosoma fervidum* Lefev.: *Parthenium hysterophorus* L. (COMP—Micho.)  
*Eupatorium daleoides* (DC.) Hemsl.  
(COMP—Micho.)
- Promecosoma inflatum* Lefev.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Col.)
- Promecosoma lugens* Lefev.: *Prosopis* sp. (MIMO—Guanj.)
- Promecosoma sallaei* Lefev.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Col.)  
*Eupatorium quadrangulare* DC. (COMP—Jal.)
- Rhadbophorus mexicanus* Jac.: *Eysenhardtia polystachya* (Ort.) Sarg.  
(FABA—VC.)
- Typophorus chalceus* Lefev.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Chps.)
- Typophorus cyanipennis*  
Lefev.: *Malvastrum coromandelianum* (L.) Garcke  
(MALV—Micho.)
- Typophorus mexicanus* Jac.: *Parthenium hysterophorus* L. (COMP—Micho.)  
*Ipomoea stans* Cav. (CONV—Micho.)
- Typophorus viridicyaneus*  
(Crotch): *Cordia ferruginea* (Lam.) Roem. & Schult.  
(EHRET—VC.)  
*Pithecellobium dulce* (Roxb.) Benth.  
(MIMO—Mor.)
- Xanthonia tuberosa* Jac.: *Quercus purulbana* Trel. (FAG—Nay.)

## HALTICINAE

- Allochroma nigroplagiatum* Jac.: *Buddleia tomentella* Standl. (LOGAN—D.F.)
- Blepharida marmorata* Jac.: *Bursera copallifera* (DC.) Bullock  
(BURS—Guerr.)
- Disonycha brevilineata* Jac.: *Wedelia filipes* Hemsl. (COMP—Micho.)
- Disonycha crenicollis* Say: *Bebbia juncea* (Benth.) Greene (COMP—Son.)
- Disonycha* spp.: *Amaranthus Palmeri* S. Wats. (AMAR—Chih.)  
*Ipomoea longifolia* Benth. (CONV—Dur.)  
*Jatropha macrorhiza* Benth. (EUPHORB—Chih.)  
*Xanthium* sp. (COMP—Chih.)
- Homophoeta simulans* Jac.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—VC.)  
*Crotolaria mucronata* Desv. (FABA—Chps.)
- Oedionychis conspurcata* Jac.: *Buddleia sessiliflora* H. B. K. (LOGAN—Dur.)  
*Eupatorium collinum* DC. (COMP—Dur.)
- Oedionychis panamensis* Jac.: *Quercus purulbana* Trel. (FAG—Nay.)  
*Lantana Camara* L. (VERB—Oax.)
- Oedionychis* spp.: *Eupatorium daleoides* (DC.) Hemsl.  
(COMP—Micho.)  
*Verbesina serrata* Cav. (COMP—Nay.)  
*Buddleia tomentella* Standl. (LOGAN—D.F.)  
*Salmea scandens* (L.) DC.? (COMP—Chps.)  
*Ipomoea pedicellaris* Benth. (CONV—Chps.)  
*Buddleia sessiliflora* H. B. K. (LOGAN—Micho.)  
*Buddleia* sp. (LOGAN—Jal.)
- Phrynocephala pulchella* Baly: *Prosopis* sp. (MIMO—Jal.)
- Systema variabilis* Jac.: *Eupatorium quadrangulare* DC. (COMP—Jal.)  
*Eupatorium collinum* DC. (COMP—Dur.)
- Systema* spp.: *Baccharis ramulosa* (DC.) A. Gray  
(COMP—Jal., Micho.)  
*Amaranthus Palmeri* S. Wats. (AMAR—D.F.)  
*Buddleia sessiliflora* H. B. K. (LOGAN—Micho.)  
*Verbesina serrata* Cav. (COMP—Nay.)

## HISPINAE

- Bradycoryna pumila* Guer.: *Waltheria americana* L. (STERC—Jal.)  
*Abutilon americanum* (L.) Sweet (MALV—Sin.)  
*Sida cordifolia* L. (MALV—Oax.)
- Bradycoryna* sp.: *Abutilon americanum* (L.) Sweet (MALV—Sin.)
- Chalepus acuticornis* (Chap.): *Aloysia gratissima* (Gill. & Hook.) Troncoso  
(VERB—Dur.)
- Chalepus amicus* Jac.: *Philodendron anisostomum* Schott  
(ARA—Chps.)
- Chalepus consanguineus* Jac.: *Verbesina Greenmani* Urb. (COMP—Jal.)  
*Benthamantha mollis* (H.B.K.) Alef.  
(FABA—Micho.)

<i>Chalepus morio</i> (Fabr.):	<i>Desmodium Lindheimeri</i> Vail (FABA—Micho.) <i>Benthamantha mollis</i> (H.B.K.) Alef. (FABA—Micho.)
<i>Chalepus omogerus</i> (Crotch):	<i>Benthamantha mollis</i> (H.B.K.) Alef. (FABA—Micho.)
<i>Microrhopala rubrolineata</i> Mann.:	<i>Brickellia vernicosa</i> Rob. (COMP—Zac.) <i>Encelia halimifolia</i> Cav. (COMP—Son.)
<i>Ocototoma scabripennis</i> Guer.:	<i>Lantana glandulosissima</i> Hayek (VERB—Micho., Jal.) <i>Eupatorium collinum</i> DC. (COMP—Dur.) <i>Quercus astriglans</i> Warb. (FAG—Dur.)
<i>Stenopodius</i> sp.:	<i>Sphaeralcea</i> sp. (MALV—Zac.)
<i>Uroplata sulcifrons</i> Jac.:	<i>Melanthera nivea</i> Sm. (COMP—Chps.)

## CASSIDINAE

<i>Cassida pallidula</i> Boh.:	<i>Solanum elaeagnifolium</i> Cav. (SOL—Zac.)
<i>Charidotis yucatanensis</i> Jac.:	<i>Verbesina sphaerocephala</i> Gray (COMP—Jal.)
<i>Chelymorpha biannularis</i> <i>fasciata</i> (Boh.):	<i>Mandevilla foliosa</i> (Muell. & Arg.) Hemsl. (APOCY—Micho.) <i>Ipomoea murucoides</i> R. & S. (CONV—Micho.)
<i>Chelymorpha catenulata</i> Boh.:	<i>Ipomoea mutabilis</i> Lind. (CONV—Nay.)
<i>Chelymorpha juvenca</i> Boh.:	<i>Vachellia Farnesiana</i> (L.) Wight & Arn. (MIMO—Col.)
<i>Chelymorpha vittata</i> Jac.:	<i>Pithecellobium dulce</i> (Roxb.) Benth. (MIMO—Jal.)
<i>Chirida signifera</i> (Herbst.):	<i>Ipomoea ampullacea</i> Fern. (CONV—VC.) <i>Ipomoea mutabilis</i> Lindl. (CONV—Nay.)
<i>Coptocyclus emarginata</i> Boh.:	<i>Ipomoea pedicellaris</i> Benth. (CONV—Nay.) <i>Ipomoea murucoides</i> R. & S. (CONV—Micho.) <i>Vernonia</i> sp. (COMP—Micho.) <i>Pharbitis cathartica</i> (Boiv.) Choisy (CONV—Micho.)
<i>Coptocyclus</i> spp.:	<i>Ipomoea pedicellaris</i> Benth. (CONV—Nay.) <i>Ipomoea mutabilis</i> Lindl. (CONV—Nay.) <i>Ipomoea murucoides</i> R. & S. (CONV—Jal.) <i>Ipomoea ampullacea</i> Fern. (CONV—VC.) <i>Ipomoea purga</i> (Wender) Hayne (CONV—Chps.) <i>Ipomoea stans</i> Cav. (CONV—Zac.) <i>Ipomoea hirsuta</i> Jacq. (CONV—Ariz.)
<i>Mesomphalia punicea</i> Boh.:	<i>Ipomoea ampullacea</i> Fern. (CONV—VC.)
<i>Physonota caudata</i> Boh.:	<i>Diphysa spinosa</i> Rydb. (FABA—VC.)
<i>Physonota disjuncta</i> (Chevr.):	<i>Senecio salignus</i> DC. (COMP—Micho.) <i>Baccharis heterophylla</i> H. B. K. (COMP—Jal.)

## CURCULIONIDAE

<i>Apion</i> spp.:	<i>Vachellia Farnesiana</i> (L.) Wight & Arn. (MIMO—Dur.)
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- Apion* spp. *Platymiscum trifoliatum* Benth. (FABA—Nay.)  
*Sphaeralcea* sp. (MALV—Chih.)  
*Myrmecodendron Hindsii* (Benth.) Br. & Rs.  
(MIMO—Dur.)  
*Robinia neomexicana* A. Gray (FABA—Ariz.)  
*Hymenoclea salsola* Torr. & Gray (COMP—Son.)  
*Brickellia vernicosa* Rob. (COMP—Dur.)  
*Neltuma glandulosa* (Torr.) Br. & Rs.  
(MIMO—Son.)  
*Acaciella texensis* (Torr. & Gray) Br. & Rs.  
(MIMO—Dur.)  
*Helenium Hoopesii* A. Gray (COMP—Nay.)  
*Baccharis ramulosa* (DC.) A. Gray  
(COMP—Nay.)
- Cactophagus* sp.: *Opuntia* sp. (CACT—Jal.)  
*Cautoderus nigrocinctus* *Vachellia Farnesiana* (L.) Wight & Arn.  
Champ.: (MIMO—Micho.)  
*Coleocerus* spp.: *Poponax cymbispina* (Sprague & Riley)  
Br. & Rs. (MIMO—Micho.)  
*Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Micho.)
- Conotrachelus* sp.: *Prosopis* sp. (MIMO—Jal.)  
*Cratosomus* sp.: *Quercus purulbana* Trel. (FAG—Nay.)  
*Curculio* sp.: *Ipomoea stans* Cav. (CONV—Micho.)  
*Epicaerus* spp.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—VC.)  
*Baccharis ramulosa* (DC.) A. Gray  
(COMP—Nay.)  
*Ipomoea stans* Cav. (CONV—Zac.)  
*Colubrina glomerata* (Benth.) Hemsl.  
(RHAM—VC.)
- Exophthalmus* sp.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Chps.)
- Geraeus* sp.: *Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Jal.)
- Hadromeropsis* sp.: *Mimosopsis aculeaticarpa* (Ort.) Br. & Rs.  
(MIMO—D.F.)
- Isodachrys crispum* Howden: *Quercus clivicola* f. *consanguinea* CH Muell.  
(FAG—Dur.)
- Laemosaccus plagiatus* (Fabr.): *Quercus undata* Trel. (FAG—Dur.)  
*Vachellia Farnesiana* (L.) Wight & Arn.  
(MIMO—Ariz.)  
*Ceanothus buxifolia* Willd. (RHAM—Dur.)
- Lixus* sp.: *Franseria ambrosioides* Cav. (COMP—Son.)  
*Baccharis angustifolia* Michx. (COMP—Sin.)
- Minyomerus* sp.: *Senegalia Greggii* (A. Gray) Br. & Rs.  
(MIMO—Son.)
- Pandeleteinus lucidillus* *Neltuma glandulosa* (Torr.) Br. & Rs.  
Howden: (MIMO—Son.)

<i>Pandeteius rotundicollis</i> Fall:	<i>Quercus grisea</i> Liebm. (FAG—Dur.)
<i>Pandeteius</i> spp.:	<i>Acacia cochliacantha</i> Humb. & Bonpl. (MIMO—VC.) <i>Quercus purulbana</i> Trel. (FAG—Dur.) <i>Quercus grisea</i> Liebm. (FAG—Dur.) <i>Quercus aristata</i> Hook. & Arn. (FAG—Dur.)
<i>Rhodobaenus</i> sp.:	<i>Eupatorium quadrangulare</i> DC. (COMP—Jal.) <i>Verbesina Greenmani</i> Urb. (COMP—Jal.) <i>Melampodium divaricatum</i> (Rich.) DC. (COMP—VC.)
<i>Rhynchites</i> spp.:	<i>Quercus purulbana</i> Trel. (FAG—Nay.) <i>Quercus grisea</i> Liebm. (FAG—Dur.) <i>Quercus clivicola</i> f. <i>consanguinea</i> CH Muell. (FAG—Dur.)
<i>Tachygonus</i> sp.:	<i>Robinia neomexicana</i> A. Gray (FABA—Ariz.)

PLANT FAMILY ABBREVIATIONS USED.—AMAR—Amaranthaceae; APOCY—Apocynaceae; ARA—Araceae; CACT—Cactaceae; CAESALP—Caesalpiniaceae; COMP—Compositae; CONV—Convolvulaceae; EHRET—Ehretiaceae; EUPHORB—Euphorbiaceae; FABA—Fabaceae; FAG—Fagaceae; LAB—Labiatae; LOGAN—Loganiaceae; MALV—Malvaceae; MIMO—Mimosaceae; ONAG—Onagraceae; PALM—Palmae; RHAM—Rhamnaceae; SALIC—Salicaceae; SOLAN—Solanaeae; STERC—Sterculiaceae; VERB—Verbenaceae; VIT—Vitaceae; ZYGO—Zygophyllaceae.

#### LITERATURE CITED

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#### BOOK NOTICE

GALL MIDGES OF ECONOMIC IMPORTANCE. VOL. VIII. GALL MIDGES—MISCELLANEOUS. By W. Nijveldt. Crosby Lockwood & Son Ltd., 26 Old Brompton Road, London, S.W. 7. 222 pp., frontispiece, 29 figs. 1969. \$5.40.

This is the final volume in a series by the late H. F. Barnes, to whom this one is dedicated by W. Nijveldt of the Institute of Phytopathological Research, Wageningen. It includes "gall midges whose larvae are zoophagous and fungivorous, as well as those living on certain weeds," and is divided into two parts. Part I, pp. 19–135, includes discussions of the groups just mentioned; Part II is on the identification of gall midges, with a short essay on "The biological approach to the species problem" from notes left by Barnes. Finally, there are 13 pages each of Addenda to Vols. I–VII, and References, plus an excellent index of plants, prey, parasites, etc., and one of taxonomic and popular names.—HUGH B. LEECH, *California Academy of Sciences, San Francisco.*